Proposed Plan
Lenz Oil Services, Inc., Superfund Site
DuPage County, Illinois
July 1998

Introduction

This Proposed Plan identifies the U.S. Environmental Protection Agency (U.S. EPA) cleanup recommendation for the Lenz Oil Services, Inc., Superfund (Lenz Oil) site in DuPage County, Illinois. The Lenz Oil site is the location of a former waste oil recycling and transfer facility near Lemont, Illinois. Past operations at the Lenz Oil facility have led to the release of contaminated oil and solvents to facility soils, which then resulted in the presence of a contaminated layer of oil on the shallow ground water, or "aquifer," beneath the site. Due to this release of contaminants to area soils and groundwater, the Lenz Oil site was placed on the national Superfund list of contaminated hazardous waste sites.

For each Superfund site, U.S. EPA publishes a Proposed Plan to describe the type of cleanup approach it is recommending for a site and to explain the reasoning for the recommendation, so that community members and other parties interested in the site's future can understand the options available and provide their comments, support, or objections to U.S. EPA's recommendation. After taking into consideration comments on this Proposed Plan for the Lenz Oil site, and evaluating any new information, U.S. EPA will publish a Record of Decision, or "ROD," with its final cleanup recommendation for the site.

A number of cleanup options, or "Remedial Alternatives," for the Lenz Oil site are presented and described in this Proposed Plan. To address the contamination problem at the site, U.S. EPA is proposing Remedial Alternative 9A, with a contingency plan to implement Remedial Alternative 10 or 11, or some other innovative cleanup technology, based on the results of test studies which will be conducted. These three alternatives and the other remedial alternatives that U.S. EPA considered for the Lenz Oil site are discussed in this Proposed Plan.

The "contingency plan" is being included as part of U.S. EPA's recommendation for the Lenz Oil site so that several innovative technologies, which were not evaluated, but may be able to provide a level of protection similar to that of Alternative 9A while being more cost effective, can be tested prior to starting the cleanup. If the general level of protection to human health and the environment offered by Alternative 9A can be achieved by an alternate and more cost-effective cleanup technology, the alternate technology will be implemented instead of Alternative 9A. In the case that U.S. EPA decides that another alternative besides Alternative 9A should be recommended for cleaning up the Lenz Oil site, a document called an "Explanation of Significant Differences", or "ESD," will be published, and a public meeting will be held to discuss the proposed approach.

It is important to note that changing the cleanup plan from Alternative 9A to another technology will require that the new plan provides a level of protection of human health and the environment comparable to that provided by Alternative 9A. Studies will be carried out for each of the alternative technologies being considered to determine which would be effective at cleaning up the Lenz Oil site. One factor that will be evaluated as part of these studies is how much contaminated oil the technology will remove. In addition to the volume of oil removed by each technology, short-term and long-term hazards due to implementing the technology will also be considered in evaluating whether the recommended alternatives or one of the contingent alternatives will be implemented.

The cleanup at the Lenz Oil site will be completed in two phases. In Phase 1, Alternative 9A or the selected alternate technology will be designed and carried out to address the principal threat at the site, which is the contaminated oil layer on the aquifer. Although removing the contaminated oil from the site will have a positive impact on the quality of ground water that has been in contact with the oil, U.S. EPA cannot predict how much of a positive impact will result. To find out whether Phase 1 will result in federal and state groundwater quality standards being achieved, ground water will be monitored for at least one year after Phase 1 is complete. If, based on the results from this sampling period, it appears that natural attenuation of ground water will allow groundwater quality standards to be achieved in a reasonable amount of time, then nothing further (except for continued monitoring) will need to be done.

On the other hand, if the required levels of groundwater quality are not being achieved and it does not seem likely that they will be achieved in a reasonable amount of time, Phase 2 action will be required to ensure that groundwater standards will be met. The Phase 2 cleanup will address residual groundwater contamination that may still be present after Phase 1 is complete. Because "a reasonable amount of time" is not a well-defined concept, whether or not the time needed for ground water to achieve applicable standards is "reasonable" will be carefully discussed by U.S. EPA and the Illinois Environmental Protection Agency (IEPA). The determination of whether the amount of time is reasonable or not, and whether Phase 2 action is needed, will be explained in an ESD, the official decision document, and a public meeting will be held so that community members can provide input on the Phase 2 decision.

All of the remedial alternatives described in this Proposed Plan pertain to Phase 1 cleanup only.

The main components of Alternative 9A, the recommended alternative for Phase 1, are:

- Excavation of contaminated oil layer
- Treatment of the excavated material using a technology called stabilization/ solidification
- Placement of the stabilized material on a portion of the site which will serve as an on-site corrective action management unit or "CAMU"[1]

The main components of Alternative 10, a contingent alternative for Phase 1, are:

- Vacuum-enhanced pumping of the contaminated oil layer using thirty below-ground extraction wells
- Off-site disposal of collected oil at a permitted incineration facility
- Extraction, via the same below-ground wells, and treatment of contaminant vapors from the subsurface

The main components of Alternative 11, another contingent alternative for Phase 1, are:

- In-place treatment of oil and oil-contaminated soil, gravel and bedrock by heating the subsurface using "thermal wells" to drive off the contaminants
- Capture and treatment of contaminant vapors released from the subsurface

To assess all three alternatives, as part of this Proposed Plan U.S. EPA is recommending that a number of treatability studies be carried out during the predesign phase.[2] The treatability studies will evaluate one or both of the alternate cleanup approaches described above, and possibly other approaches, as well as determine the suitability of different stabilization matrices for Alternative 9A. The objectives of the stabilization treatability studies will be to identify the best stabilization matrix, to demonstrate that the treated material is stable and will meet design specifications, and to evaluate the need for and type of cap for the CAMU area.

Regardless of whether Alternative 9A, 10 or 11, or an alternate approach, is used in Phase 1 cleanup of the Lenz Oil site, the recommended cleanup plan will also provide for long-

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[1] "CAMU" is a concept that was developed as part of the statute called the Resource Conservation and Recovery Act (RCRA). Part of this statute lays out requirements for the transfer, storage, and disposal of hazardous wastes. Using a CAMU at the Lenz Oil site means that the stabilized waste will be placed in an area of the site in accordance with RCRA regulations for CAMUs to ensure that public health and the environment are not endangered or adversely affected.

[2] The predesign phase refers to the first step after the Record of Decision (ROD) is published and before the cleanup option is designed.

term site maintenance and monitoring activities and for permanent deed restrictions. Site maintenance and monitoring will include periodic and regular site inspections to ensure that all parts of the remedy are still in place and operating and will include regular sampling of ground water in the vicinity of the site. The type and extent of deed restrictions which may be imposed on the Lenz Oil property and property(ies) to the south of Jeans Road will depend on which cleanup option is implemented and how much subsurface contamination remains at the site. Examples of restrictions that might be employed would be restrictions on soil excavation and/or construction activities on a property or prohibiting installation of drinking water wells in the shallow aquifer beneath a property

U.S. EPA's recommendation for cleaning up the Lenz Oil site is based on information collected during environmental investigations and studies, referred to as the remedial investigation (RI) and feasibility study (FS). The RI/FS work was jointly overseen by U.S. EPA and IEPA. Public input on cleanup alternatives considered for the Lenz Oil site is an important contribution to the remedy selection process. Based on new information or public comment, U.S. EPA and IEPA may modify the recommended alternative or select another alternative presented in this plan or in the FS Report. U.S. EPA and IEPA encourage community members to review and comment on all technologies and alternatives considered for the Lenz Oil site.

Site Background

The Lenz Oil property is bounded by Jeans Road on the south, by Route 83 on the west, by open land on the east, and by the Atchison, Topeka, and Santa Fe Railroad on the north. The contamination that originated from the former Lenz Oil facility and currently extends beyond Jeans Road for approximately 250 feet is also considered to be part of the Lenz Oil site. The site is about 600 feet northwest of the Des Plaines River, in southeast DuPage County, Illinois. Much of the area to the south of Jeans Road, including a portion of the Lenz Oil site, is part of a 100-year flood plain for the Des Plaines River.

From April 1961 through November 1985, Lenz Oil operated as a recycling, storage, and transfer facility for waste oil and solvent. In July 1981, the IEPA issued a "developmental" permit for Lenz Oil to operate as a waste management facility. In 1982, IEPA cited the facility for operating as a Resource Conservation and Recovery Act (RCRA) hazardous waste facility without having an interim status permit. Although an application for the required RCRA permit was then submitted, the facility owner subsequently withdrew the permit application in November 1984, saying that the facility no longer handled hazardous waste. After a site inspection visit early in 1985, IEPA obtained a court order for Lenz Oil to prepare and implement a cleanup and closure plan for the site. Lenz Oil failed to carry out major portions of the court order and, in April 1986, filed for bankruptcy.

On January 17, 1986, IEPA filed a State Record of Decision (State ROD) for immediate removal action at the Lenz Oil site. IEPA site investigations initiated in November 1986 revealed the following items present on the site: 200 drums; three, 50,000-gallon, unlined underground storage tanks; several tank trucks; and 35 above-ground tanks. In addition, soil and ground water were contaminated with oil and solvent waste. IEPA initiated cleanup of the site the following year and by mid-1988 had incinerated all drum, tank, and tank truck contents; shredded and incinerated all on-site containers; emptied and decontaminated all tank trucks on site; and demolished and removed all buildings, above-ground structures, and below-ground structures from the site. About 21,000 tons of contaminated soil were excavated and incinerated. In addition, the IEPA cleanup included filling the on-site surface impoundment areas and providing nearby residences with municipal water hook-ups.

In September 1989, the Lenz Oil site was listed on the National Priorities List (NPL), and in November 1989, the potentially responsible parties (PRPs) for the site signed an Administrative Order on Consent (Order) with U.S. EPA and IEPA. Under this Order, the PRPs agreed to conduct an RI/FS, under the joint oversight of U.S. EPA and IEPA, to determine the nature and extent of the remaining site contamination.

RI/FS Activities

The RI/FS began in January 1991 and was completed in April 1997. The RI/FS lasted longer than anticipated in part because a "phased" approach was used. During the RI approximately fifty soil borings were completed, seven monitoring well clusters and two replacement monitoring wells were installed, and a supplemental groundwater investigation was carried out. Results of the RI indicated the presence of potential chemicals of concern both on- and off-site. These chemicals included inorganic compounds, such as arsenic, antimony, barium, beryllium, cadmium, chromium, lead, and mercury; and organic compounds, such as benzene, trichloroethane, vinyl chloride, polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PAHs).

During the RI, a black, oily layer of contamination, containing compounds similar to those in site soils and ground water, but at much higher concentrations, was found floating on and within the shallow aquifer (which is about 5 to 8 feet below ground surface) beneath and to the south of Jeans Road. The substance is a light, non-aqueous phase liquid (LNAPL), with the term "non-aqueous" referring to the fact that because it is an oil, it doesn't mix with water. In November 1994, an investigation was completed to determine the extent of LNAPL in the ground water under and near the site. Investigation results indicated an LNAPL layer, up to 2 inches thick, was present in the shallow aquifer. The LNAPL area was at that time estimated to cover about 40,000 square feet, most of which was beyond the facility boundary. This movement of the LNAPL off the site was due to the fact that it had migrated to ground water and had been carried along by it. The total LNAPL volume in the shallow aquifer was initially estimated to be about 9,200 gallons.

In August 1997, additional field activities revealed that the LNAPL area was larger than at first estimated. Based on collection of nine additional soil borings, installation of six groundwater piezometers (a type of monitoring well), and observations of oil in the unused residential well south of the site, it was re-estimated that the LNAPL covered an area of approximately 67,000 square feet.

Based on the investigation results, which showed that contamination remaining in the site soil was minimal and that the principal threat at the site was the highly contaminated LNAPL layer, the FS focused on how to remove the LNAPL. A number of different alternatives were developed and evaluated, using the nine evaluation criteria specified in the NCP. Variations on the eleven initial alternatives were also evaluated. Preliminary evaluations of several more innovative approaches, including vacuum enhanced recovery and in-place low temperature thermal desorption, were also done.

Summary of Site Risks and Anticipated Future Land Use

During the RI/FS, U.S. EPA and IEPA prepared a baseline risk assessment to characterize potential risks to human health and the environment caused by chemicals of potential concern at the site. Exposure was evaluated in relation to two land use scenarios: (1) current land use conditions, including trespassing, residential use of adjacent properties, and recreational use of nearby surface water; and (2) future land use, including on-site and adjacent residential use and short-term, on-site workers.

Currently, the Lenz Oil property is zoned as light industrial and it is anticipated that this will continue to be the land use in the future. The property to the south of Jeans Road is also zoned as light industrial; however, because a residence exists on the property currently, future owners of the property could continue to use the area for the same purpose. For this reason, in evaluating current and future risks that might be posed by the Lenz Oil site, U.S. EPA assumed that the Lenz Oil property, which is not currently being used for residential purposes, would not be used for residential purposes in the future. However, since the portion of the site to the south of Jeans Road is occupied by a residence even though it is zoned as light industrial, U.S. EPA assumed that the parcel may continue to be used for residential purposes.

The primary exposure pathways evaluated were skin contact with soil, ground water, surface water, or sediment; and ingestion of soil, ground water, or surface water. Risks due to the LNAPL, either through skin contact, ingestion, or breathing emissions from it, were not evaluated in the risk assessment report; because of the extremely high concentrations of the chemicals it contains, the risks associated with coming into contact with the LNAPL are assumed to be unacceptable.

Risk assessment results indicate that adjacent and future residents or on-site workers or trespassers may be exposed to potential chemicals of concern by touching or ingesting the LNAPL or LNAPL-contaminated soil or ground water: or by breathing in particles or vapors from the LNAPL or LNAPL-contaminated soil or ground water. Risk associated with the potential for migration of chemicals into the Des Plaines River would primarily occur via transport of chemicals in ground water or by migration along underground conduits. This potential risk was not quantitatively evaluated: however, four monitoring wells were installed approximately 100 feet north of the river, and ten soil borings in the area between the site and an underground pipeline were completed. Results from the four groundwater monitoring wells near the river showed several inorganic compounds, specifically iron, lead and manganese, at levels above maximum contaminant levels (MCLs), which are standards developed for drinking water wells. However, because the samples were not filtered prior to being analyzed, it is likely that the metals were adsorbed onto particulate matter in the ground water. For this reason, the apparent levels of these metals in the ground water may be elevated compared to actual levels. No organic compounds were detected in any of the four monitoring wells near the river. In addition, no oil seeps were observed along the banks of the Des Plaines River during the RI.

Contaminants such as PCBs and PAHs, which are present in very high concentrations in the LNAPL at Lenz Oil, have been shown to be cancer producing compounds. State and federal environmental regulations require action to clean up these compounds when they present a risk to public health and the environment. Several areas of the Lenz Oil site have contamination at these regulatory action levels. In addition, the LNAPL is considered to be a "principal threat," which is a substance, material, or media which is the primary source of unacceptable risks to human health or the environment. As a result, U.S. EPA and IEPA are proposing a cleanup plan to remove as much LNAPL as possible and to address groundwater contamination and any residual soil contamination at the Lenz Oil site.

Summary of Remedial Alternatives

As part of the RI/FS, U.S. EPA identified and evaluated alternatives to address threats or potential threats posed by the Lenz Oil site. Of eleven initial alternatives and their variations that were considered, U.S. EPA and IEPA identified five that represented the range of viable cleanup alternatives for the site to evaluate in depth. All five alternatives (except Alternative 1: No Action), include the following common components:

- Fencing and deed restrictions
- Groundwater management during cleanup activities
- Evaluation of whether natural attenuation is appropriate for addressing any remaining groundwater contamination in a Phase 2 cleanup action
- Long-term operation and maintenance

In developing the basic approaches for the overall cleanup for the Lenz Oil site, U.S. EPA had to evaluate ways of removing LNAPL from the aquifer (Phase 1); ways of managing ground water encountered during LNAPL cleanup activities at the site (Phase 1); and ways of treating, restoring, or otherwise addressing any remaining groundwater contamination after LNAPL cleanup activities were completed (Phase 2). Ways of addressing the LNAPL in the subsurface during Phase 1 cleanup include: (1) pumping the LNAPL out of the subsurface either via extraction wells or from trenches dug into the ground; (2) physically removing the LNAPL and LNAPL-contaminated material by digging them out; (3) enhanced variations of either of these latter options; or (4) treating the LNAPL and subsurface contamination while still in the ground. In all cases, the LNAPL and LNAPL-contaminated material that are extracted would be appropriately treated once removed from the ground. The appropriate treatment method for pure LNAPL that is recovered will be to transport it off-site to a hazardous waste incinerator. For the LNAPL-contaminated material, several different treatment options are available. The two options believed to be most viable and that are included in one or more remedial alternatives in this Proposed Plan are solidification/stabilization and low temperature thermal desorption.

Ways of managing ground water encountered during Phase 1 cleanup activities include: (1) pumping it to a treatment system and disposing of the treated ground water in a sewer; or (2) pumping it out, separating out residual oil, and, if it meets criteria required by the publicly owned treatment works (POTW), disposing of it directly into a sewer without further treatment. The type of treatment system used, if one is necessary, will depend on what types of contaminants are present in the ground water at levels that exceed the criteria of the POTW. For example, if one or more VOCs in the ground water need to be removed prior to discharge to a POTW, a granular activated carbon treatment system or an air stripper system might be used.

Ways of addressing any remaining groundwater contamination--Phase 2 of the cleanup--include: (1) allowing ground water to naturally attenuate; (2) pumping ground water to the surface and treating it; or (3) placing appropriate deed restrictions on the titles of all the properties that might be affected. The first two options address the problem in such a way that ground water is eventually restored, while the third option works by limiting exposure to potential users. Deed restrictions that might be implemented in the third option might state, for example, that no private or commercial wells could be drilled on the properties and that no unauthorized excavations could be done on the properties. If deed restrictions were selected as a way of addressing ground water, properties which may need restrictions placed on their titles include the southern edge of the Lenz Oil property, a portion of Jeans Road south of the Lenz Oil property, and parts (approximately one acre total) of two privately-owned properties south of the site beyond Jeans Road.

In order to determine which of these methods for addressing residual groundwater contamination is appropriate, additional groundwater sampling will be done once cleanup of the LNAPL and LNAPL-contaminated material, Phase 1, is complete. If it can be demonstrated that natural attenuation will result in all federal and state groundwater quality standards being met in a reasonable amount of time and that it would be protective of human health and the environment, then natural attenuation may be selected as the remedy for ground water. When the decision regarding Phase 2 cleanup is made, U.S. EPA will publish the decision in an ESD and hold a public meeting to hear what the community thinks of the recommended Phase 2 remedy.

Summary of Phase 1 Remedial Alternatives

The section that follows highlights distinguishing features of the alternatives considered for Phase 1 cleanup at the Lenz Oil site and provides the estimated cost of each alternative.

Alternative 1--No Action

Alternative 1 involves no active cleanup or long-term site management. A no action alternative is required by law to give U.S. EPA a basis for comparison. In the no action alternative, the long-term risks to human health and the environment would be essentially the same as those established in the baseline risk assessment.

Estimated Cost: $0

Alternative 2--LNAPL Containment and Partial Recovery via Passive Collection

- LNAPL containment and periodic, passive LNAPL recovery over a 30-year period using four covered trenches.
- Off-site disposal of the collected LNAPL at a permitted incineration facility.
- Collection of ground water that accumulates in the four containment trenches, treatment if necessary, and disposal via public sewer to a local publicly owned treatment works (POTW).
- Estimated percentage of LNAPL that will be recovered ranges from 10 to 20%.

Estimated Cost: $5.9 million

For Alternative 2, four below-ground, covered trenches would be dug in the area of the LNAPL. The trenches, which would be filled with gravel and capped with a clay seal, would be about three feet wide, twelve feet deep, and 250 feet long, and would run parallel to Jeans Road. The LNAPL would "passively" or "naturally" accumulate in the bottom of the trenches over time. Depending on the amount of rainfall in the area and the rate at which the ground water and LNAPL migrate, it may take several months for a significant amount of LNAPL to accumulate. Accumulated LNAPL would then be siphoned out of the trenches and transported off-site for disposal. Ground water which may have accumulated in the trenches will also be removed and treated, if necessary, prior to disposal to the POTW. The type of system used to treat the ground water would depend on what types of contaminants were present at levels requiring treatment. Examples of groundwater treatment systems that might be used include granular activated carbon and air stripping. Collection of LNAPL and ground water from the trenches would occur periodically over a 30-year period.

Alternative 5A--LNAPL Containment and Partial Recovery via Active Collection

- LNAPL containment and periodic active recovery over a 10-year period using four trenches.
- Off-site disposal of collected LNAPL at a permitted incineration facility.
- Recovery of LNAPL will be accomplished by active pumping of ground water and LNAPL for several months out of the year during periods of low water table.
- Collection of extracted ground water and ground water that accumulates in the four containment trenches; treatment if necessary, and disposal of collected ground water via a public sewer to a local publicly owned treatment works (POTW).
- Estimated percentage of LNAPL that will be recovered ranges from 30 to 50%.

Estimated Cost: $10.3 million

For Alternative 5A, four covered trenches would be constructed as described in Alternative 2. Instead of relying on natural forces to allow LNAPL to accumulate in the trenches, as in Alternative 2, ground water and LNAPL would be actively pumped for several months of the year to induce flow into the four trenches. Accumulated LNAPL would then be siphoned out of the trenches and transported off-site for disposal. Ground water which may have accumulated in the trenches will also be removed and treated, if necessary, prior to disposal to the POTW. As indicated for Alternative 2, the type of system used to treat the ground water would depend on what types of contaminants were present at levels requiring treatment. Groundwater treatment systems that might be used include granular activated carbon and air stripping. Collection of LNAPL and ground water from the trenches would occur periodically over a 10-year period.

Alternative 9A--LNAPL Excavation; On-Site S/S Treatment and Disposal of LNAPL-Contaminated Material; Off-Site LNAPL Disposal

- Excavation and on-site treatment of LNAPL-contaminated soil, gravel, and bedrock via solidification/stabilization (S/S) to be completed in one year.
- On-site disposal of treated soil, gravel, and bedrock into corrective action management unit (CAMU).

- Liquid LNAPL recovered during excavation would be disposed of off site at a permitted incineration facility.
- Collection of ground water during excavation, treatment if necessary, and disposal of collected ground water via a public sewer to a local publicly owned treatment works (POTW).
- Estimated percentage of LNAPL that will be recovered ranges from 90 to 99%.

Estimated Cost: $12.5 million

For Alternative 9A, LNAPL and LNAPL-contaminated material would be dug out, treated on-site, and placed back on the Lenz Oil property north of Jeans Road. The treated material would be placed on the Lenz Oil property in a waste management unit referred to as a "CAMU", which stands for "corrective action management unit." For this alternative, soil overlying the LNAPL-contaminated areas would be excavated. If sampling showed that the soil was not contaminated, it would be stockpiled for use later in grading and filling activities. If sampling results indicated the soil was contaminated, the soil would be placed in the treatment system. The same steps would be taken for LNAPL-contaminated gravel and bedrock, and excavation would continue until all LNAPL and LNAPL-contaminated soil, gravel, and bedrock was removed and treated.

In order to carry out the excavation activities required for this alternative, during the seven to twelve months of excavation, Jeans Road would have to either be rerouted to traverse the northern edge of the Lenz Oil property, or traffic would have to be redirected to an alternate route. In addition, several storage buildings east of the house on the south side of Jeans Road would have to be torn down and replaced later, and the resident in the house would have to be vacated either temporarily or permanently. Costs for temporarily or permanently relocating the resident are included as part of the cleanup expense. Depending on how extensively the LNAPL has migrated around and underneath the foundation of this residence, the structure may have to be demolished in order to allow for all of the LNAPL-contaminated material to be recovered. If demolition is necessary, the resident would be permanently relocated. Alternatively, if the LNAPL has migrated a limited distance underneath the foundation of the residence, it may be possible to employ an alternative technology, such as a vacuum extraction system, to adequately remove the LNAPL from beneath the residence without having to resort to demolition of the structure. In all cases where excavation is part of the cleanup plan, U.S. EPA would be in close communication with the resident south of the Lenz Oil property and with other nearby residents.

The type of treatment that is part of Alternative 9A is solidification/stabilization, or "S/S." Liquid LNAPL recovered during excavation would not be treated; instead, it would be disposed of off site at a permitted incineration facility. However, all LNAPL-contaminated soil, gravel, and bedrock would be placed in an on-site treatment unit which would "mix" the material with suitable binding agents, such as Portland cement, fly ash, lime, or combinations of several different agents. The ideal mix of stabilizing agents would be determined during predesign studies by combining contaminated material from the site with a number of different stabilizing agents in a test laboratory and testing the resulting material for stability and other characteristics. Upon mixing with the stabilizing matrix shown to be most effective, the LNAPL-contaminated material will bind with and adhere to the stabilizing agents to form a solid, non-leaching cement-like material. The addition of binding agents will result in a 30% increase in volume.

After the LNAPL-contaminated material is treated in the on-site treatment unit, the stabilized material would be placed on the Lenz Oil property north of Jeans Road onto an area designated as a corrective action management unit, or "CAMU". A CAMU is a waste management unit subject to very specific requirements under a law that governs hazardous waste management practices for operating commercial and industrial facilities that handle hazardous wastes. The law containing these requirements is called the Resource Conservation and Recovery Act, or "RCRA". In constructing the CAMU on the Lenz Oil property, all appropriate requirements would be followed to ensure that the CAMU would serve as a stable and suitable unit for storing the stabilized material. In addition, the type of cap that is appropriate for covering the CAMU, as determined in a predesign study, would be constructed over the unit.

Alternative 9B--LNAPL Excavation; On-Site LTTD Treatment and Disposal of LNAPL-Contaminated Material; Off-Site LNAPL Disposal

- Excavation and on-site treatment of LNAPL-contaminated soil, gravel, and bedrock using low temperature thermal desorption (LTTD) to be completed in one year.
- On-site disposal of treated soil, gravel, and bedrock into corrective action management unit (CAMU).
- Liquid LNAPL recovered during excavation would be disposed of off site at a permitted incineration facility.
- Collection of ground water during excavation, treatment if necessary, and disposal of collected ground water via a public sewer to a local publicly owned treatment works (POTW).
- Estimated percentage of LNAPL that will be recovered ranges from 90 to 99%.

Estimated Cost: $18.6 million

Like Alternative 9A, Alternative 9B involves physically excavating all LNAPL and LNAPL-contaminated material from the site, sending liquid LNAPL off-site for treatment at a permitted facility, treating the remaining material on-site, and placing the treated material on the Lenz Oil property in a designated CAMU. The excavation would proceed as described for Alternative 9A and, like Alternative 9A, would require at least temporarily, and possibly permanently, relocating the resident in the house to the south of the Lenz Oil property. Like Alternative 9A, this alternative would also involve either rerouting Jeans Road or directing traffic to a different route.

Alternative 9B differs from Alternative 9A in the type of treatment that would be used. For Alternative 9B, instead of solidifying or stabilizing the excavated material, the material would be placed in an on-site low temperature thermal desorption, or "LTTD," treatment unit. In LTTD, waste material is heated to very high temperatures causing the contaminants to physically separate from the soil, gravel, or bedrock. Combustion of the material is minimized by using a gas other than oxygen in the heating chamber. The vapors arising as the material is heated must be treated further. Typically, this is done by first cooling the vapors and then separating the liquids that condense out from the gases. The gaseous stream is then routed to an afterburner where any residual contaminants are burned. The liquid stream typically must be sent off site to a permitted incinerator due to the higher concentrations of contaminants it may contain.

The treated soil from the process would be placed on the Lenz Oil property into a designated CAMU, as with Alternative 9A, and, again, all appropriate requirements for the CAMU would have to be met.

Alternative 10: Vacuum Enhanced Recovery of LNAPL and VOCs in Subsurface Soils; Off-Site LNAPL Disposal

- Vacuum-enhanced pumping of LNAPL over a 5-year period using thirty below-ground extraction wells.
- Off-site disposal of collected LNAPL at a permitted incineration facility.
- Extraction, via the same wells mentioned above, and treatment of contaminant vapors from subsurface soils.
- Collection of ground water extracted during the process, treatment if necessary, and disposal via a public sewer to a local POTW.
- Estimated percentage of LNAPL that will be recovered ranges from 50 to 80%.

<u>Estimated Cost</u>: $9.3 million

For the vacuum-enhanced recovery ("VER") approach, thirty extraction wells would be installed on the site, and enhanced pumping of LNAPL would occur by applying a vacuum to the wells. At the same time, contaminant vapors from subsurface soil, sometimes called "soil gas," would be pumped out and treated using an afterburner if necessary. Ground water that is extracted in the process would be separated from the LNAPL and then either discharged directly, or after treatment if needed, to a local POTW. Applying a vacuum to the wells will also result in the enhanced removal of VOCs evaporating from the subsurface soils. In addition, the increased air flow through the aquifer system due to the vacuum may encourage bacterial growth and result in biodegradation of some of the contaminants. Air injection wells between the VER wells could also be installed to further increase the air flow in the aquifer.

The estimated percentage of LNAPL that would be recovered using this approach ranges from 50 to 80%, and depends in part on soil types and subsurface properties. This is one of the alternate, or contingent, remedies that will be studied during predesign.

Under Alternative 10, traffic along Jeans Road would only have to be temporarily rerouted, if at all, during the construction of the extraction wells. The resident(s) in the house to the south of Jeans Road might have to be temporarily relocated during part of the construction, but permanent relocation would not be necessary. Some of the storage buildings to the east of the house may have to be torn down and replaced once the extraction period is over, but the house would not have to be demolished.

Alternative 11: In-Place Low Temperature Thermal Desorption

- In-place treatment of LNAPL and LNAPL-contaminated soil, gravel and bedrock by a combination of "thermal wells" and "thermal blankets" constructed on site.
- Extraction and treatment of contaminant vapors from subsurface soils.
- Collection of ground water extracted during the process, treatment if necessary, and disposal via a public sewer to a local POTW.
- Estimated percentage of LNAPL that will be treated ranges from 90 to 99%.

<u>Estimated Cost</u>: $7.3 million

In this alternative, the same technology as described in Alternative 9B, low temperature thermal desorption, or "LTTD," would be used. The difference between Alternative 9B and Alternative 11, however, is that for Alternative 9B, LTTD is performed *ex situ*, which means in a treatment unit above the ground, while for Alternative 11, LTTD is performed *in situ*, which means the material is treated in place. Instead of having to excavate the LNAPL-contaminated material prior to treating it, treatment equipment, called thermal wells and thermal blankets, would be placed throughout the site to heat the material in place. The compounds that are separated from the subsurface due to the high temperatures are captured via the thermal wells and thermal blankets. As described under Alternative 9B, the captured vapors would then be condensed, with the gas stream being routed to an afterburner, or treated in some other way, and the liquid stream being sent off site for appropriate disposal. No soil or other contaminated material would have to be moved either before or after the treatment.

Estimated amount of LNAPL that would be treated using this approach ranges from 90 to 99%. This technology was developed fairly recently and has not been widely tested at hazardous waste sites and is one of the alternate, or contingent, remedies that will be studied during predesign.

Under Alternative 11, for much of the one year construction period, Jeans Road would have to either be rerouted to traverse the northern edge of the Lenz Oil property or traffic would have to be redirected to an alternate route. The resident in the house to the south of Jeans Road might have to be temporarily relocated during part of the construction, but permanent relocation would not be necessary. It is likely that the storage buildings to the east of the house would have to be torn down and later replaced, but the house would not have to be demolished.

U.S. EPA Recommendation

U.S. EPA recommends Alternative 9A as the preferred cleanup option for the Lenz Oil site. However, a second part of the recommendation is that predesign pilot tests be run on Alternatives 10 and 11, and possibly other innovative technologies if identified, to determine if either of these alternatives or another innovative technology would provide a level of protection to human health and the environment similar to that offered by Alternative 9A but at a lower cost. In order to implement Alternative 9A, treatability studies to test the effectiveness of stabilization on the contaminants at the Lenz Oil site would have to be conducted first to demonstrate that Alternative 9A would be effective.

The reason that Alternative 9A is being recommended as the primary Phase 1 cleanup alternative, with Alternatives 10 and 11 designated as "contingency" alternatives is that Alternatives 10 and 11 were not thoroughly evaluated as potential remedial alternatives during the RI/FS process for the Lenz Oil site. If U.S. EPA, in consultation with IEPA, decides that one of the contingency remedies should be implemented instead of Alternative 9A, U.S. EPA will publish an ESD explaining the reasoning for the recommendation, and a meeting with the public will be held so that community members can express their opinion about the recommendation. U.S. EPA is recommending the three alternatives for consideration because they appear to be implementable and because projections indicate that they would remove the majority of the highly-concentrated LNAPL. The remedial alternative that is ultimately implemented at the Lenz Oil site will be protective of human health and the environment and will comply with state and federal regulations.

As stated previously, the decision regarding Phase 2 cleanup will also be published in an ESD, and input from the community will be gathered at a public meeting once the ESD is issued.

The National Contingency Plan (NCP) describes nine criteria against which U.S. EPA must measure and compare each remedial alternative considered for a site. The nine criteria listed in the NCP are:

- Overall protection of human health and the environment
- Compliance with the potential ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume of wastes through treatment
- Short-term effectiveness
- Implementability
- Costs
- State acceptance
- Community acceptance

Discussions about how each Phase 1 alternative presented in this Proposed Plan "measures up" to the first seven of the nine criteria follow. The eighth criterion, State acceptance, will determined by IEPA. U.S. EPA will be able to determine how well its recommendation for the Lenz Oil site meets the ninth criterion, community acceptance, after public comments on this Proposed Plan are received.

Overall Protection of Human Health and the Environment
The protection of human health and the environment offered by Alternatives 2 and 5A is limited due to the amount of LNAPL that will remain in the subsurface once the Phase 1 action is complete. Although deed restrictions prohibiting excavation on the land would minimize the chance of someone coming into contact with the LNAPL, in order for these restrictions to be effective they need to be rigorously enforced. On the other hand, Alternative 9A, and possibly Alternatives 10 and 11, would offer a greater degree of protection of human health and the environment because more of the primary source of contamination, the principal threat, would either be removed and treated, or treated in place. In addition, removing or treating a greater volume of the LNAPL increases the probability that natural attenuation of ground water--the least costly way to address any groundwater contamination remaining--will result in attainment of federal and state groundwater standards.

Compliance with the Potential ARARs
In order to implement any of the remedial alternatives presented in this Proposed Plan, all relevant federal and state laws and regulations would have to be followed. Examples of state regulations that would be followed during the course of the remediation include chemical-specific requirements, such as those specifying the allowable levels of contaminants in drinking water aquifers and surface water bodies, and regulations regarding allowable noise levels. State requirements regarding construction activities, permitted hours for construction work, and work permits would also be complied with. If ground water is discharged to a local POTW, it would be treated prior to discharge to the public sewer if it did not meet the POTW's standards for discharge. Air emissions from an afterburner on an LTTD unit, an S/S treatment system, VER wells, or thermal wells and blankets would have to be monitored and be in compliance with federal and state

laws. Federal and state regulations regarding construction in a flood plain would also apply to the site since the area south of Jeans Road is part of a 100-year flood plain.

Alternatives 9A, 10 and 11 would all meet the substantive requirements of the applicable or relevant and appropriate state and federal regulations (ARARs).

Long-Term Effectiveness and Permanence
Removal and remediation of the highly-concentrated LNAPL are permanent and effective measures. Alternatives 9A, 9B, 10 and 11 show the most promise for removing the largest volume of LNAPL from the subsurface beneath the Lenz Oil site. Although excavation of bedrock in the presence of ground water is difficult, and complete excavation of the LNAPL may not be accomplished, the estimated removal of 90% or more of the LNAPL for both Alternative 9A and the more costly Alternative 9B would lead to the greatest amount of LNAPL being removed. The percentages of LNAPL that could be removed or treated, respectively, by Alternatives 10 and 11 are estimated to be 50% to 80% and 90% to 99%, respectively. By comparison, it is estimated that LNAPL removal via passive recovery (Alternative 2) would range from 10% to 20%, and LNAPL removal via active recovery (Alternative 5A) would range from 30% to 50%. All of the estimated percent removals are, of course, only estimates.

Alternatives 9A and 9B both involve treating LNAPL-contaminated material and placing the material on the Lenz Oil property in a CAMU waste management unit. Assuming the effectiveness of the two treatment methods are basically the same, the long-term effectiveness and permanence of Alternatives 9A and 9B would depend on the adequacy of the CAMU. Although the area of the CAMU would not be within the 100-year flood plain area, if an unusual flooding incident caused the CAMU area to be inundated with water, this would likely result in a decreased effectiveness of the remedy.

For Alternative 10, the amount of LNAPL removed from the subsurface and, for Alternative 11, the effectiveness of the LTTD treatment, would be critical in determining the long-term effectiveness of the two remedies. For these two alternatives, LNAPL-contaminated material may remain in the subsurface in the part of the site that is for the most part within the 100-year flood plain. If a 100-year flood occurred, inundation of the area with water might cause any untreated LNAPL remaining beneath the surface to shift and migrate.

Reduction of Toxicity, Mobility, or Volume of Wastes Through Treatment
Alternatives 9A, 9B, and 11, and, to a certain degree Alternative 10, satisfy the statutory preference for using treatment as a principal element because they address the principal threat through treatment. Alternative 9A, however, would only reduce the toxicity and mobility of the contaminants in the LNAPL-contaminated materials; the volume of the treated material would actually increase by 30%. The increase would be due to the addition of non-toxic binding agents and not to an increase in hazardous wastes;

nevertheless, a greater volume of material would have to be handled. The exact degree to which Alternative 9A could reduce the mobility and toxicity of the contaminants by stabilizing them will be evaluated as part of the predesign treatability studies that will be conducted.

Alternatives 9B and 11 would reduce the toxicity and volume of the contaminants in the LNAPL-contaminated materials via treatment by LTTD. The LTTD process uses high temperatures to separate the contaminants from the soil (or gravel or bedrock). These contaminants would then either be destroyed in an afterburner or sent off site for treatment. In terms of volume of LNAPL removed or treated, Alternatives 9A, 9B and 11 are the most effective.

If collected ground water meets the limits for discharge to a POTW, it will be discharged into a sewer and subsequently processed and treated at the POTW that is selected. This will result in a reduction in the toxicity and volume of the constituents in the ground water.

Short-Term Effectiveness
The majority of LNAPL recovery that would be achieved under Alternatives 2, 5A and 10, would occur shortly after the remedy was constructed, and the amount of LNAPL recovered would diminish as time went on. In addition, due to the use of trenches in Alternatives 2 and 5A, and groundwater extraction in Alternatives 5A and 10, negative short-term impacts due to these alternatives would be minimal. However, the trenches and extraction wells would be present on the site for a number of years. For Alternative 2, the trenches would remain in place for at least 30 years; for Alternative 5A, the trenches would remain in place for at least 10 years; and for Alternative 10, the extraction wells would remain in place for at least 5 years. Because the trenches would be sealed and the wells would be locked, short-term risks due to these alternatives would be minimal.

Under Alternatives 9A, 9B and 11, the majority of the remediation activities would be completed over a period of about seven (7) months to a year once on-site construction was initiated. The short duration for construction of these alternatives and the continual presence of either contractors or site security during those seven months would reduce the short-term risk to residents and potential trespassers during remedial construction. However, the two alternatives involving excavation, 9A and 9B, produce the greatest chance that contaminants could be emitted into the air and migrate off-site. Alternatives 9A and 9B also entail the greatest risk of direct exposure to construction workers or trespassers. Noise generated by excavation activities could also be at dangerous levels.

During construction of Alternatives 9A, 9B, and 11, potential risks to on-site workers, nearby residents, and the environment would be addressed by monitoring air emissions during all excavation activities and using engineering control measures, such as periodic watering, to control dust. The fence surrounding the site would be maintained to minimize trespassers coming into contact with hazardous substances, and, if the excavation area in Alternatives 9A and 9B was not secured or sealed on a daily basis, security professionals would be hired to monitor the site during non-working hours.

Alternatives 9B and 11, which involve heating the LNAPL-contaminated material, could result in releases of VOCs to the air. For each of these alternatives, a comprehensive air monitoring program would be implemented.

Implementability
Alternatives 2, 5A, and 10 are the most easily engineered and implemented of the alternatives considered. None of these alternatives are very invasive or require extremely complex equipment.

The equipment for treatment using S/S in Alternative 9A is available and technically proven. Alternatives 9A and 9B would both entail excavation of gravel and possibly bedrock, which may prove to be very difficult. The shallow water table and correspondingly shallow LNAPL layer at the Lenz Oil site allow excavation to be considered as a technically feasible and cost-effective remedy for the site. However, the degree to which the LNAPL has migrated into bedrock will not be fully known until excavation starts. The implementability of excavating LNAPL-contaminated bedrock will depend on how fractured or intact the bedrock is and on bedrock density. If the bedrock is very competent, excavation may be very difficult, if it is possible at all. Another potential implementation problem for excavation is the possible need to manage large volumes of water due to the shallow water table.

The shallow water table could also cause implementation problems for Alternative 11. The success of the LTTD treatment will require that the area containing the LNAPL-contaminated material be dewatered. If the area is not dewatered, excessive costs might be incurred due to heat being lost to vaporizing the water instead of being used to treat the contaminated material.

In terms of legal issues related to implementability, the use of a CAMU for storage of the treated LNAPL-contaminated material in Alternative 9A carries with it the possibility for changes to the rules and requirements regarding CAMUs in the near future. Depending on what changes are made, using a CAMU as part of the Phase 1 remedy for the Lenz Oil site may become non-viable. This would be a possibility, for example, if the requirements for a CAMU were revised such that the approach in Alternative 9A would not be able to meet the requirements or such that the costs of meeting the requirements would render Alternative 9A to no longer be cost-effective. If changes to the CAMU rule were to result in Alternative 9A no longer being a viable alternative, and if neither of the alternate approaches were demonstrated to be effective at the site, U.S. EPA would have to evaluate other approaches for addressing the site and document its decision in an ESD.

Cost

Except for Alternatives 9A and 9B, the cost of each of the alternatives includes a contingency of $1.3 million for addressing the potential for residual groundwater contamination in Phase 2. Because Alternatives 9A and 9B would remove essentially all of the LNAPL and would lead to the most favorable conditions for natural attenuation to be effective, the $1.3 million is not included as a contingency in the cost for these two alternatives. The cost for each of these alternatives, however, does include a contingency of $1.5 million for construction of a multilayer cap over the CAMU waste management unit in case a cap is determined to be necessary.

Alternative 2, which would cost an estimated $5.9 million, is the least expensive of the alternatives. Alternative 9B, which would cost an estimated $18.6 million, is the most costly of all the alternatives considered. Of the recommended alternative and the two contingency alternatives, Alternative 11, at $7.3 million, is the least expensive; Alternative 10, at $9.3 million, is the next least expensive; and Alternative 9A, at $12.5 million, is the most expensive. Due to the fact that the amount of the LNAPL, the extent to which it has penetrated bedrock, and the condition of the subsurface are all unknowns, the cost of implementing Alternative 9A could be significantly greater than projected. Also, the projected cost of Alternative 11 could be either overestimated or underestimated due to the lack of historical cost information for the technology. The uncertainty in the estimated costs of the other alternatives should be less than in these latter two.

Another way to consider the costs of the alternatives and to try to compare the relative cost-effectiveness of each is to look at the cost per each 10% of LNAPL the alternative would remove (or treat, in the case of Alternative 11). If the amount of LNAPL removed (or treated) by an alternative is equal to the <u>minimum</u> estimated percent removal (or treatment), the following "per percent" costs, in order of least costly to most costly, are obtained:

• Alternative 11	$ 81,100 per every 10% of LNAPL treated
• Alternative 9A	$138,800 per every 10% of LNAPL removed
• Alternative 10	$186,000 per every 10% of LNAPL removed
• Alternative 9B	$206,700 per every 10% of LNAPL removed
• Alternative 5A	$343,300 per every 10% of LNAPL removed
• Alternative 2	$590,000 per every 10% of LNAPL removed

So, if each alternative is only able to remove (or treat) the <u>minimum</u> amount of LNAPL projected, Alternative 11 would be the most cost effective alternative, followed by Alternative 9A and then by Alternative 10.

If the amount of LNAPL removed (or treated) by each alternative is equal to the maximum estimated percent removal (or treatment), the following "per percent" costs, in order of least costly to most costly, are obtained:

•	Alternative 11	\$ 73,700 per every 10% of LNAPL treated
•	Alternative 10	\$116,250 per every 10% of LNAPL removed
•	Alternative 9A	\$126,300 per every 10% of LNAPL removed
•	Alternative 9B	\$187,900 per every 10% of LNAPL removed
•	Alternative 5A	\$206,000 per every 10% of LNAPL removed
•	Alternative 2	\$295,000 per every 10% of LNAPL removed

So, if each alternative is able to remove (or treat) the maximum amount of LNAPL projected, Alternative 11 would be the most cost effective alternative, followed by Alternative 10 and then by Alternative 9A.

In both cases, the recommended alternative, Alternative 9A, and the two contingency alternatives, Alternatives 10 and 11, appear to be the most cost-effective cleanup approaches.

Summary

In summary, when the recommended alternative, Alternative 9A, and the two contingency alternatives, Alternatives 10 and 11, are compared and evaluated according to the nine criteria listed in the NCP, it appears that they all, to varying degrees, fulfill the objectives of the first seven of the nine criteria. Predesign treatability studies will shed more light on the relative effectiveness of the three alternatives, potential problem areas, and their potential for meeting the objective of protecting human health and the environment. All three would be carried out in such a way that the remedy would be in compliance with potential ARARs.

In terms of long-term effectiveness and permanence, because Alternative 9A will be placing the treated material on an area outside of the 100-year flood plain, it may pose an advantage over Alternative 10, in which some LNAPL would remain in the subsurface in the 100-year flood plain, and over Alternative 11, which would entail treating the contamination in place in the 100-year flood plain.

Alternative 9A would reduce the toxicity and mobility of the LNAPL through treatment; however, the volume of the material to be handled would increase by approximately 30%. The volume of LNAPL that Alternative 10 could potentially address is less than that projected for Alternatives 9A and 11, but treatability studies may show that it could remove more LNAPL than is now projected. Alternative 11 could potentially reduce the toxicity, mobility, and volume of the LNAPL almost completely through treatment.

In terms of short-term effectiveness, Alternatives 9A and 11 would address the greatest volume of LNAPL within the first year the remedy is implemented. The short-term risks posed by implementing the cleanup would be greatest for Alternative 9A. Alternative 10 would be in place for approximately 5 years.

The question of implementability is not completely defined for any of the three alternatives. The excavation in Alternative 9A may or may not prove to be difficult. The effectiveness of vacuum enhanced recovery, in Alternative 10, may or may not work in the type of soils present at the Lenz Oil site, and the implementability of Alternative 11, which has only been field tested at a limited number of sites, is also an unknown. Implementability is a key factor that will be looked at during predesign studies.

Comparison of the estimated costs for each of the three alternatives is relatively easy to do; however, the uncertainty in the costs for Alternatives 9A and 11 must be kept in mind. Given the current cost estimates, it appears that Alternative 11 would be the most cost-effective approach. The next most cost-effective alternative would depend on whether the minimum or maximum projected percentage for LNAPL removal is achieved. If the alternatives achieve only the minimum projected percentage removal, then Alternative 9A may be more cost-effective than Alternative 10. However, if each technology is able to remove the maximum projected percentage of LNAPL, then Alternative 10 may be slightly more cost-effective than Alternative 9A.